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The Environmental Significance of Sacred Forest Sites and the Sotential for Human Interference in the AkhmasSofla Tribe (Northern Morocco)

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Abstract
This study assesses the environmental significance of Sacred Forest Sites (SFS) in the AkhmasSofla Tribe (AST), Northern Morocco. Using an integrated geographical approach involving 1.25,000 topographic mapping and field surveys across four villages, the research documents 100 Sacred Tree Sites. These sites host trees with supremeenvironmental quality, mainly cork oak (*Quercus suber L.*) and fruit-bearing species. Crucially, 28% of SFS harbor tree species are not have available elsewhere in the region. This highlights their role as biodiversity refuge. However, significant factors put these sites in jeopardy: (86%) of them lacks designated guards, 27% has experienced theft or treasure hunting. Above all, agricultural expansion is encroaching on these areas. The study concludes that while SFS are vital for preserving arboreal biodiversity, their sustainability faces immediate threats from weak legal protection and declining socio-cultural practices. These findings emphasize the urgent need for enhanced preservation strategies integrating legal frameworks and community engagement to protect this invaluable biocultural heritage.
Keywords: Sacred Forest Sites; AkhmasSofla Tribe; Indigenous Population; Northern Morocco; Biocultural Heritage.

Résumé
L'importance environnementale des sites forestiers sacrés et le potentiel d'intervention humaine dans la tribu d'AkhmasSofla (Nord du Maroc)
Cette étude évalue l'importance environnementale des sites forestiers sacrés (SFS) dans la tribu AkhmasSofla (TAS), au nord du Maroc. En utilisant une approche géographique intégrée comprenant une cartographie topographique au 1:25 000 et des enquêtes de terrain dans quatre villages, la recherche documente 100 sites arborés sacrés. Ces sites abritent des arbres

d'une qualité environnementale exceptionnelle, principalement le chêne-liège (Quercus suber L.) et des espèces fruitières. De manière cruciale, 28 % des SFS hébergent des espèces d'arbres inexistantes ailleurs dans la région. Cela souligne leur rôle de refuge pour la biodiversité. Cependant, des facteurs significatifs mettent ces sites en péril : 86 % d'entre eux manquent de gardiens désignés, 27 % ont subi des vols ou des fouilles de trésors. Par-dessus tout, l'expansion agricole empiète sur ces zones. L'étude conclut que si les SFS sont essentiels à la préservation de la biodiversité arborée, leur durabilité fait face à des menaces immédiates liées à une protection juridique faible et au déclin des pratiques socioculturelles. Ces résultats soulignent l'urgence de renforcer les stratégies de préservation intégrant des cadres juridiques et l'engagement communautaire pour protéger ce patrimoine bioculturel inestimable.
Mots-clés : Sites forestiers sacrés ; tribu AkhmasSofla ; population autochtone ; nord du Maroc ; conservation des arbres ; patrimoine bioculturel.

المخلص

الأهمية البيئية للأماكن المقدسة الغابية وأشكال التدخل البشري في قبيلة أخماس السفلى -شفشاون- (شمال المغرب)

الملخص:

تهدف هذه الدراسة إلى تقييم الأهمية البيئية للأماكن المقدسة الغابية بقبيلة أخماس السفلى شمال المغرب، اعتمادًا على مقاربة جغرافية مندمجة تجمع بين تحليل الخرائط الطبوغرافية بمقياس 1:25.000 والعمل الميداني الذي تم القيام به في أربعة دواوير. وقد مكّن هذا النهج وبعض (Quercus suber L.) من حصر 100 مكان مقدسوالتي تتميز باحتضانها لأشجار ذات جودة بيئية عالية، خاصة البلوط الفليني الأنواع المثمرة. كما كشفت النتائج أن 28% من هذه المواقع تضم أنواعًا شجرية نادرة وغير موجودة في باق أرجاء الدوار، مما يبرز دورها كملاجئ حيوية لحفظ التنوع البيولوجي.

غير أن هذه المواقع تواجه عدة تهديدات، من أبرزها غياب الحراسة في 86% منها، وتعرض 27% منها لظاهرة النهب أو البحث عن الكنوز. ومن زاوية أخرى، يشكل التوسع الزراعي ضغطًا متزايدًا على هذه المجالات. عموما، فرغم الأهمية البالغة لهذه المواقع في الحفاظ على التنوع الشجري، فإن استدامتها أضحت مهددة بشكل مباشر بسبب ضعف الحماية القانونية وتراجع الممارسات الاجتماعية-الثقافية المرتبطة بها. وتؤكد هذه النتائج الحاجة الملحة إلى تبني استراتيجيات فعالة للحماية، تقوم على تعزيز الإطار القانوني وإشراك الساكنة المحلية من أجل صون هذا التراث البيوثقافي القيّم.

الكلمات المفتاحية: الأماكن المقدسة الغابية- قبيلة الأخماس السفلى- الساكنة المحلية- شمال المغرب-حماية الأشجار- التراث الإيكولوجي/الثقافي

Introduction

Cultural landscapes, that are recognized by the World Heritage Committee, are the ones where religious phenomena intersect with natural elements like sacred forests (*Juhé-Beaulaton, 2006*). These sacred natural sites hold special spiritual significance for communities (Wild & McLeod, 2008). They are increasingly recognized as vital for conserving both biological and cultural diversity *(Verschuuren et al., 2012*). Moreover, they often function as refugia for biodiversity in human-modified landscapes (*Bhagwat &Rutte, 2006; Dudley et al., 2009*).

In Africa, religious beliefs have been shown to motivate conservation in sacred forests (*Byers et al., 2001)*. West African communities, in particular, maintain numerous sites using cultural practices (*Diawuoet al., 2015*). However,

research has predominantly focused on sub-Saharan Africa. This creates a significant gap in understanding Muslim sacred natural sites in North Africa, particularly in Morocco (*Salah et al., 2018*).

Although Morocco contains a high density of sacred sites that protect vegetation through spiritual values (*Jäckle, 2017*), these ecologically important areas face threats from land-use changes and global change (*Deil et al., 2005*). This study addresses this research gap by examining the SFS of the AkhmasSofla Tribe in Northern Morocco through an integrated geographical approach that: (1) SFS were identified from topographic maps and subsequently verified through field surveys; (2) assesses the environmental status of associated trees; and (3) identifies primary conservation threats.

Material and Methodology

Study area

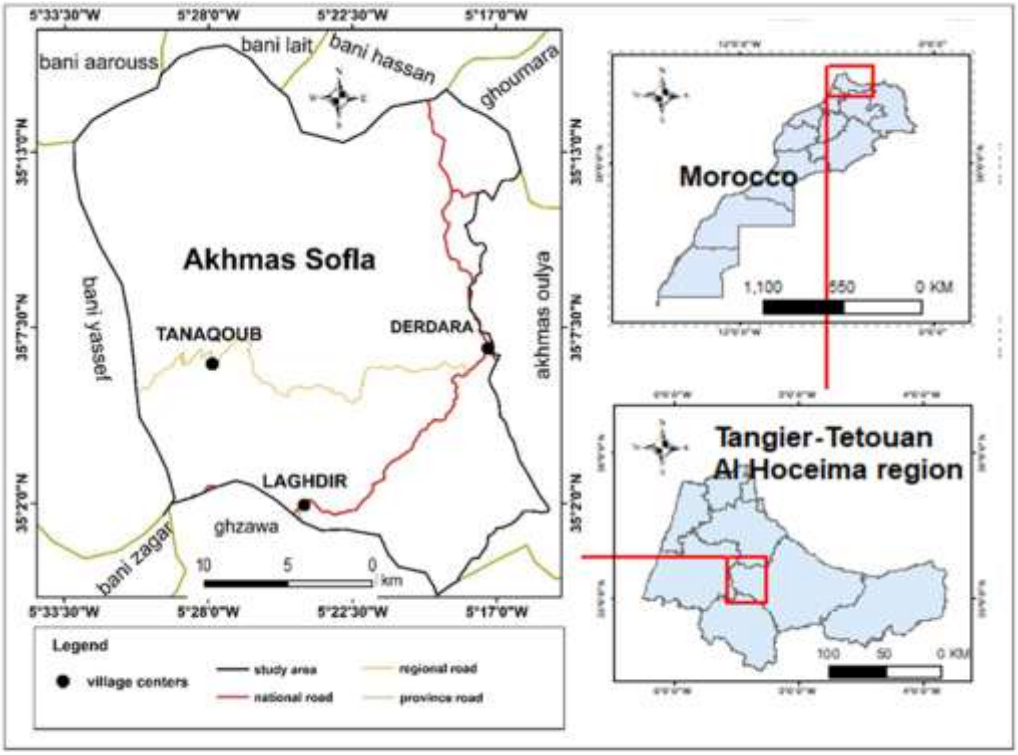
The tribe in Morocco has always played significant roles since the Roman era. That was fundamental to the formation of the Moroccan state through many dynasties. Notwithstanding,with the rise of the Alaouite state in the 17th century(El Mansour, 1990), Moroccan tribes experienced a notable decline. Some tribes became subordinate to the central authority in exchange for privileges, while others maintained a cautious stance towards the state. Generally speaking, the general Atmospher between the tribes and the state was never stable. It was often marked by tension and instabilityuntill independence (Laroui, 1977). Another characteristic of the Moroccan tribe is that it typically has a chief who holds considerable spiritual authority among its members (Hart, D. M., 2014). In the same context, the AST played a significant historical role, especially during the Spanish colonization in the 20th century.

TheAST belongs geographically to the Rif mountain range, located in the northwest of the Moroccan Kingdom between the latitudes of 55°34' and 15°35' north, and the longitudes of 17°5' and 34°5' west. Its area is over 54,000 hectares. Administratively, it falls within the Chefchaouen province, which is part of the Tangier-Tetouan-Al Hoceima region. TheAST extends across the territories of three communes: Lghadir, Tanaqoub, and Alderdara. It is bordered to the east by the *Gmara* tribal federation, to the north by the Beni Hassan, Beni Lait, and Beni Arous tribes, to the west by the Beni Youssef and Beni Zakkar tribes, and to the south by the Ghazawa tribe **(Figure 1)**.The study area exhibits a Mediterranean climate, with hot, dry summers and mild, wet winters, with an average annual rainfall between 600–800 mm. The topography is mainly mountainous. Part of the Rif mountain, with altitudes from 200 to 1200 m, is above sea level. The natural vegetation cover is dominated by broad-leaved

sclerophyllous forests, with cork oak (*Quercus suber L.*) as the most widespread species, along with other native oaks (*Quercus ilex L.*), pine species (*Pinus halepensis Mill.*), and a diverse understory of shrubs such as *Chamaerops humilis L.*and *Cistus salviifolius L.*

The population of the study area reached approximately 25,827 people according to the 2024 census. It has recorded a negative growth rate compared to the 2014 census when the population was 28,067 (**Figure 2**). Economically, the agricultural sector is the most employment-intensive one. It hosts 82 percent of the total workforce, according to data from the High Commission for Planning in Morocco(HCP/MOROCCO.2024).

Figure 1: study area



Source: Author's analysis based on field data and 1:25,000 topographic maps.

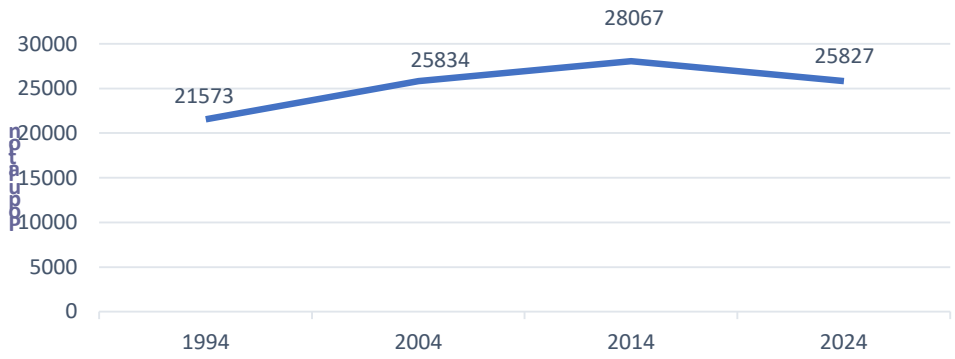


Figure 2:The population growth of the Akhmas Sofla Tribe according to official statistics

source:HCP/MOROCCO

Database

The data were obtained using a cartographic approach to inventory the SFS. This involved using a 1:25,000 topographic map to locate SFS and integrating maps using ArcGIS 10.8 software for precise georeferencing. Additional SFS were added to the database based on field verification, and the database was projected onto the study area to identify spatial clusters of the phenomenon. Complementing the cartographic approach, field studies included surveys conducted with residents in four villages of the AST. This involves over 198 respondents aged 18 and above. The survey consisted of two main components. The first addressed the relationship between sacred places and human activities, while the second focused on sacred forest cover. This survey aims to understand the local community's perspectives on sacred places and their patterns of use. The selection of villages was based on geographic distribution criteria, and field inspections were carried out to document tree species surrounding the sacred sites and assess their ecological condition.

The collected data were analyzed using integrated spatial and statistical methods. Spatial analysis in ArcGIS 10.8 determined the density and distribution patterns of SFS. Descriptive statistics from the survey responses were analysed, with frequencies and percentages calculated for all variables. The environmental quality of the trees was assessed through field assessment of specific indicators: density of crown cover, tree strength, and signs of disease or stress. Finally, threat levels for SFS were determined by triangulating survey data with direct field observations and photographic evidence.

Sampling

The target group is entirely adults aged 18 and above. This was displayed through official statistics(**Table 1**). The sample is calculated following statistical rules for sampling by implementing the following process:

$$Sample\ Size\ (n) = \frac{A}{1 + \left(\frac{A}{N}\right)} \qquad A = \frac{V * H * Z}{d}$$

n = Required sample size

N = Total population size

V = Proportion of population possessing the characteristic (set at 0.5 for maximum variability)

H = Homogeneity (1 - V = 0.5)

Z = Z-value for confidence level (1.96 for 95% confidence)

d = Margin of error (0.05)

The literacy rate was chosen as the measure of Variation and homogeneity due to its significant influence on community perceptions and practices related to sacred sites.

Table 1. The proportion of sample units of the survey directed to households in the studied hamlet

Village	Commune	Adultsaged 18 and above	The literacy rate	Sample Size (n)
Lachaich	Derdara	725	45%	51
Imherchen	Derdara	773	45%	52
Maaza	Tanaqoub	364	50%	48
Chantof	Tanaqoub	309	50%	47

Source: HCP, Morocco (2022).

The methodology for sample selection focused on individuals aged 18 and above. The sample size is calculated statistically, using the literacy rate as the primary variable to ensure a representative sample of the adult population across the four villages, resulting in a total of 198 surveys.

Vegetation Sampling

Tree diversity and environmental conditions in SFS are assessed through field observations and surveys. Given the relatively small and culturally conserved nature of each SFS, the entire area of each site is surveyed rather than using sample plots or transects.A complete inventory of all tree and shrub species within the boundaries of each of the 100 SFS is carried out. For each site, the presence of all tree and shrub species is recorded. The environmental status of large trees is assessed based on visual indicators of health and vitality. It also includes crown density, presence of dead wood, and signs of disease or stress.

Result

The study reveals that the AST is rich in SFS, with a total of 100 locations distributed throughout the tribe geographically. Despite its rich arboreal wealth, it is begun to deteriorate due to human interventions.

1- Geographical Distribution of SFS in the AkhmasSoflaTribe

The spatial analysis reveals the existence of100 SFS across the AkhmasSofla Tribe territory. Additionally, quantitative analysis of site typology (**Table 2**) shows that Al-Khalwa (wali) sites constitute the majority (50%, n=50), followed by cemeteries (24%, n=24), mosques (21%, n=21), Qoba (3%, n=3), and Zawiya(2%, n=2).

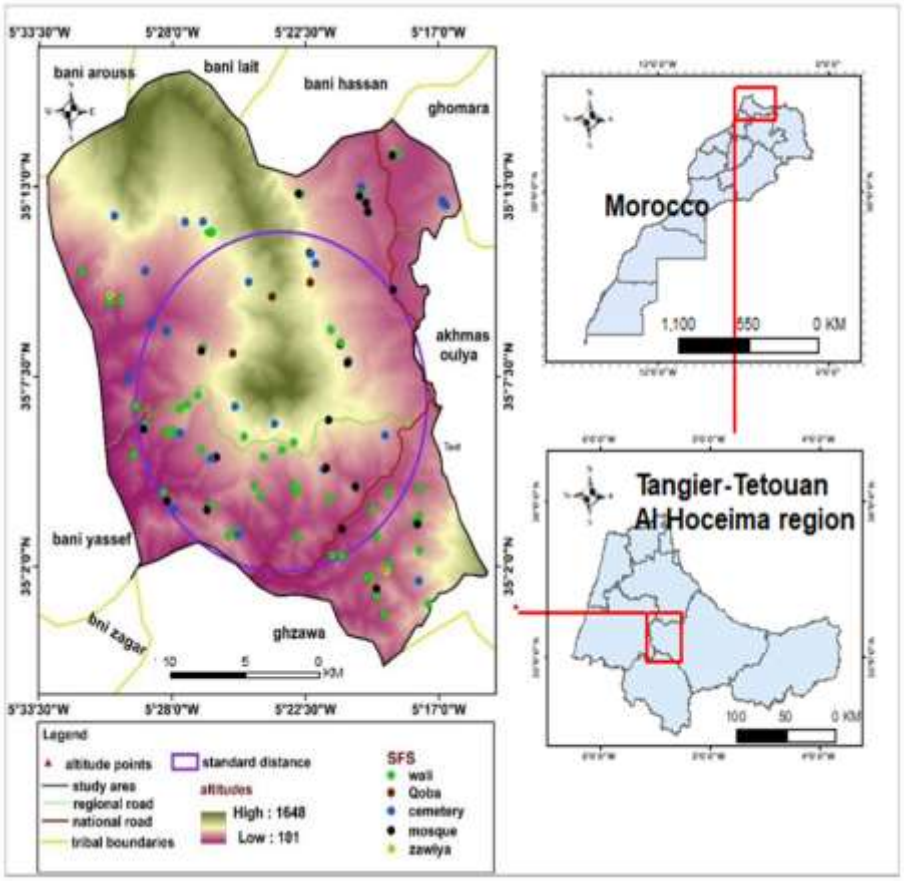
Table 2.Distribution of SFS by type

Site Type	Number	Percentage
Al-Khalwa (Wali)	50	50%
Cemeteries	24	24%
Mosques	21	21%
Qoba	3	3%
Zawiya	2	2%
Total	100	100%

Source: Topographic map data 1/25000

At the geographical distribution level, the database is mapped onto the study area to identify areas where SFS are concentrated. The SFS are diverse **(Figure 3)** and the tribe contains all types of sacred sites. It is noteworthy that these sites are predominantly associated with male names, indicating male dominance in the tribe's religious affairs. Geographically speaking, the sites are distributed throughout the tribal territory in various forms. The standard distance analysis (**Figure 3**) reveals that the phenomenon is dispersed across the AST. Additionally, SFS density increases toward the south. Another characteristic is the spatial overlap between different types of sacred sites. For example, cemeteries often contain a Khalwa(*a site referred to by local communities as the burial place of a saint*), and sometimes mosques are located near them. This indicatesthe existence of functional connections between sacred sites. Frequently, a Fakih (*mosque imam*) may be responsible for both the mosque and the cemetery simultaneously. The density of SFS is higher in low-lying areas, which typically have significant population concentrations. This suggests that most SFS are located near local communities, indicating that geomorphological factors have influenced their establishment in these areas.

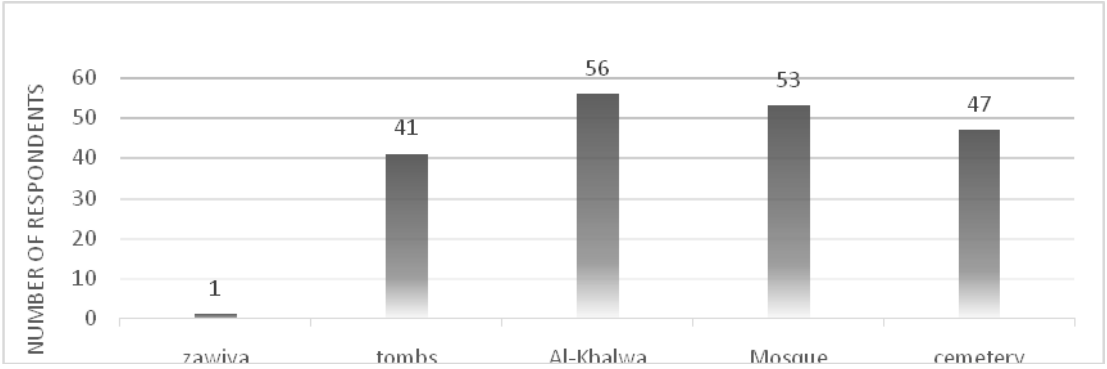
Figure 3. Kernel density map of SFS distribution in AST, showing concentration in southern lowland areas



Source: Author's analysis based on field data and 1:25,000 topographic maps

During the field study, respondents are asked about the presence of sacred sites in their area. Furthermore, to gain deeper insights, they are also asked to assess the quality of the sacred sites near them **(Figure 4)**.

Figure 4. Types of Sacred Forest sites in the AkhmasSofla TribeAST



Source: Author's analysis based on field data and 1:25,000 topographic maps

A convergence exists between the cartographic and field study data. The field study confirms the presence of all types of sacred sites within the study

area. Both methods indicate that the Al-Khalwa (Wali) confinement is the most prevalent SFS, followed by mosques, cemeteries, Qoba, and finally Zawiya.

2.The Sacred Sites and the Trees in the AkhmasSoflaTribe

The surrounding tree cover plays a crucial role in this study, that is why a significant portion of the survey is dedicated to it. It is also a major focus during the fieldwork. As previously noted, sacred sites function as a mechanism for forest conservation, particularly in areas experiencing deforestation from intensive agriculture, timber extraction, and overgrazing. When faced with such excessive exploitation, SFS become safe refuges for mature trees, which can be considered sacred trees.That derive their sanctity from these protected spaces.

Quercus suber L. is the most prevalent tree species in the SFS of the AST (**Table 3**), particularly cork oak. More than 135 sacred sites are surrounded by oak trees. Fruit-bearing trees are also significant species within the study area's sacred sites. These trees serve as ***wakf*** (religious endowments) for the sacred sites, with their produce being utilized for benefits. The number of sites surrounded by fruit-bearing trees reached 109. Dwarf shrubs, such as *Chamaerops humilis L*., also represent important vegetation formations adjacent to sacred sites. Data indicate that approximately 53 sacred sites are surrounded by these shrubs.

Table 3. Prevalence of major tree types in Sacred Forest Sites

Tree Type	*Number of Responses*	Percentage	Key Species
Cork Oak	135	100%	*Quercus suber L*
Fruit Trees	109	80.7%	*Olea europaea L., Ficus carica L., Prunus dulcis (Mill.)*
Shrubs	53	39.3%	*Chamaerops humilis L, Cistussalviifolius L.*
Other Species	42	31.1%	Various native trees

Tree species analysis reveals that SFS function as important refugia for both common and significant plant species. The prevalence of ecologically and culturally important species such as cork oak (*Quercus suber L*.) and carob (*Ceratonia siliqua L*.) underscores this role. Additionally, several documented species in Morocco are recognized for their conservation value. For example, wild arbutus (*Arbutus unedo L*.) and juniper (*Juniperusoxycedrus L*.) are often associated with well-preserved Mediterranean forest ecosystems (**Table 4**).

Table4.Types of trees andshrubs surrounding the sacred sites in the study area, according to the survey results

Local Name	English Name	Scientific Name
zayton	olive	*Olea europaea L.*
loz	Almond	*Prunus dulcis (Mill.)*
nakhl	Palm	*Phoenix dactylifera L.*
handia	Cactus	*Opuntia ficus-indica (L.) Mill.*
Bakour-karmos	Fig	*Ficuscarica L.*
tachta	beech	*Fagus sylvatica L.*
Chtapa	Cistus	*Cistus salviifolius L.*
dlam	Cork oak	*Quercus suber L.*
rand	Laurel	*Laurus nobilis L.*
khlanj	heather tree	*Erica arborea L.*
assasno/boukhano	arbutus	*Arbutus unedo L.*
admam/blah lamzah	Hawthorn	*Crataegusmonogyna Jacq.*
acharyou	Holm oak	*Quercus ilex L.*
dom	Dwarf palm	*Chamaerops humilis L.*
akraz	wild mustard	*Sinapis arvensis L.*
slagho	Carob tree	*Ceratonia siliqua L.*
aaraar	juniper tree	*Juniperusoxycedrus L.*
kolit	Aleppo pine	*Pinus halepensis Mill.*
okalyptoss	Eucalyptus	*Eucalyptus globulus Labill.*
dro	Lentisc	*Pistacialentiscus L.*

The floral inventory revealed a total species richness of 20 trees and shrubs in the sacred forest sites. The composition was dominated by native Mediterranean species, with 85% (17 species) wild trees and shrubs, while 15% (3 species) were cultivated fruit trees.

3- The Role of Sacred Sites in Protecting Trees

The findings show that SFS function as important habitats for arboreal biodiversity. The spiritual protection given to these places translates directly into better conservation outcomes, creating a distinct ecological niche compared to the surrounding landscape (**Image 1, 2, 3**).

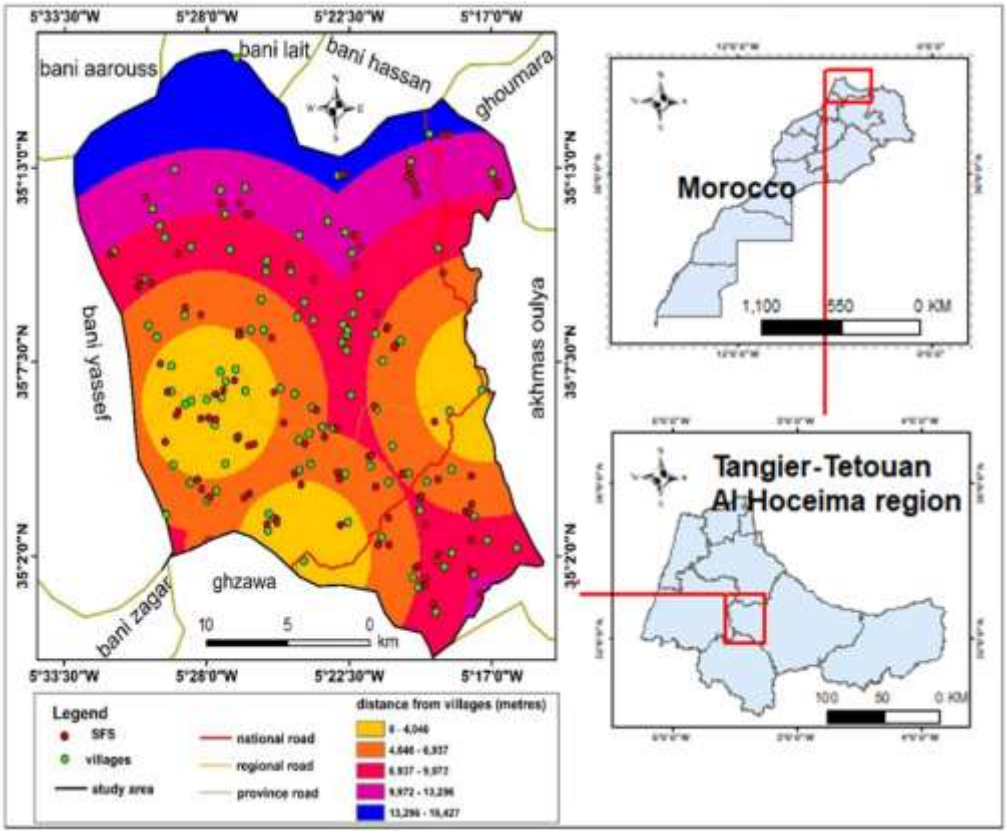
This role is quantitatively emphasized by the fact that 28% of SFS harbor tree species found nowhere else in their respective villages.This clearly identify them as repositories of rare and localized flora. These include significant populations of *Ficuscarica L.*, *Phoenix dactylifera L.*, *Opuntia ficus-indica (L.) Mill.*, *Quercus suber L.*, and *Ceratonia siliqua L.*

Image 1.Quality of some trees scattered near Masala village, Image 2.Quality of trees surrounding Sidi Bonwauer'skholwa

Image 3. Satellite image of Sidi BouNawawr'skhalwa in Douar Al-Dsheryeen

Beyond species rarity, the environmental quality of trees within the SFS is obviously superior. Field observations consistently document older individuals, denser canopies, and healthier vitality. This enhanced condition results directly from community protection, rooted in the sites' spiritual significance. Notably, this conservation ethos is nearly universal. All of the respondents affirm the need to protect these trees and view them as shared environmental heritage; regardless of individual sites' sanctity. Active, sustainable resource use—such as utilizing fruit crops for site maintenance—further strengthens this positive symbiotic relationship. The spatial distribution of these areas **(Figure5)**, reveals a high density of SFS near village centers. This emphasize how geographical proximity has been crucial in fostering and maintaining these strong community connections.

Figure 5. The geographic distribution of SFS and villages within the study area



Source: Author's analysis based on field data and 1:25,000 topographic maps

4-Types of Degradation in SFS in the Akhmas SoflaTribe

Systematic documentation identified seven primary threat categories impacting SFS integrity. Protection deficits emerged as the most widespread challenge (**Table 5**), affecting 86% of sites (n = 86), followed by agricultural encroachment (**Image 4**) at 65% (n = 65), and socio-cultural transformations (**Image 5**), based on a 79% survey response rate.

Table 5. Comprehensive threat assessment matrix

Threat Category	Prevalence	Impact Level	Primary Drivers
Protection decline	86% (n=86)	High	Limited guardians (14%), absent fencing (85%)
Agricultural expansion	65% (n=65)	High	Land conversion, economic pressures
Socio-cultural changes	79% (n=153)	High	Demographic shifts, value transformation
Structural damage	44% (n=44)	Medium	Natural decay, lack of maintenance
Treasure hunting	27% (n=27)	Medium	Economic incentives, traditional beliefs
Overgrazing	24% (n=24)	Low	Livestock pressure, seasonal patterns
Tree cutting	18% (n=18)	Medium	Resource needs, contradictory practices

.Source: Author's analysis based on field data

Cross-analysis revealed that sites experiencing multiple concurrent threats (n=62) showed significantly higher degradation rates, with protection deficits amplifying the impact of other threat factors.

Image 4. Cutting down trees near the .shrine of Sidi Bousaada	**Image 5.The deterioration of the shrine of Sidi Lahcen**
	
We can see from **Image 4** that tree-cutting activity is active in the area of Madeshar Bani Walalnear the shrine, and the cutting traces are recent.	**Image 5** shows the deteriorated condition that the shrine of Sidi Lhassan has reached, as the building has been damaged by natural factors. This shrine used to receive religious pilgrims in the past, but it has now disappeared.

Discussion

This study provides a comprehensive assessment of 100 SFS of the AST. It documents their significant conservation value within the Moroccan Mediterranean ecosystem. Our integrated geographic approach, which combines 1:25,000 topographic mapping with extensive field surveys, provides an exemplary methodology for inventorying sacred natural sites that addresses an important research gap in North African cultural ecology.

Quantitative analysis reveals compelling ecological patterns. Cork oak (*Quercus suber L.*) dominates 68%, followed by fruit trees that occupy 54.5% of the areas. Thus, confirming their key role in maintaining local biodiversity. More significantly, the SFS houses 28% of the tree species that are completely absent in the surrounding rural areas which establish them as important refuges for biodiversity. This discovery takes on special significance when we consider that these small, culturally preserved areas maintain a richness of species that is disproportionate to their size. (*Zanini et al., 2021*)

Assessment of the documented species against the IUCN Red List shows that none are currently classified as globally threatened. The majority (65%) are classified as Least Concern, while several cultivated species (35%) have not been assessed. However, consultation with national conservation references suggests that particularly many oak species (*Quercus*), including holm oak (*Quercus ilex L.*), represent distinct components of the vulnerable Mediterranean forest ecosystem in Morocco.Although not globally threatened, these SFS serve as important refuges for locally important species and threatened habitats.

This research uncovers a fundamental socio-ecological dynamic. Sites with intact architectural structures exhibit 75% better tree preservation than degraded sites. This robust quantitative relationship demonstrates that within this specific Islamic cultural context, tree sanctity derives primarily from architectural sacredness rather than inherent natural value. This finding has profound implications for conservation planning, suggesting that architectural preservation may be the most effective strategy for arboreal conservation in similar cultural settings. Field observations consistently document that tree exploitation typically commences only after structural degradation occurs, reinforcing this causal relationship.

When contextualized within the international conservation framework, these findings show significant alignment with UNESCO's Intangible Cultural Heritage Principles and CBD targets for biodiversity (*Wild & MacLeod, 2008*). Universal community support for SFS protection (100% of respondents) provides a strong basis for developing integrated conservation models that link local ecological knowledge with global standards (*Verschuren et al., 2021*). This social consensus represents a hugely underutilized resource in Mediterranean conservation planning.

The spatial distribution patterns further inform conservation strategy. SFS concentration in low-lying areas with higher population density suggests that geographical intimacy strengthens protection mechanisms. This challenges conventional conservation paradigms that often prioritize remote, uninhabited areas, instead of highlighting the conservation potential of human-shaped landscapes.

While our methodological approach is based on previous work in Northern Morocco, this study introduces important innovations in the documentation of sacred sites specifically tailored to Islamic cultural contexts. The Threat Assessment Matrix provides an evidence-based basis for targeted intervention strategies, identifying security vulnerabilities affecting 86% of websites. Collectively, these findings argue for the formal recognition of SFS within Morocco's conservation policy framework. Thus creating powerful synergies between cultural conservation and biodiversity conservation. They are in line with both the IUCN Ecosystem Management Guidelines and UNESCO's Cultural Heritage Conservation Protocol.

Conclusion

SFS are among the areas that still retain a certain natural richness. That's because they include several trees and plants that have become extinct elsewhere, or have ancient trees. The study concludes that SFS are densely and diversely distributed in the study area, with results showing that clearings are the most prevalent in the AST.In addition to graves, mosques, shrines, and some zawiyas. These sites are usually independent and have a spiritual significance, with some cases showing an overlap between SFS and graves or shrines. It is also important to note that these sacred sites have influenced the surrounding natural environment. The sanctity of the trees steems from the sanctity of the shrine, mosque, or zawiya. Therefore, if the sacred site disappears, the trees are endangered, and their sanctity diminishes.

As for the tree species associated with sacred sites, most of them belong to the predominant oak category in the field of study. However, most sacred sites

contain trees in good environmental condition, some of which are mature. These trees urgently need protection, considering the increasing human pressures. Therefore, a legal framework must be established to protect these sacred areas while ensuring that the indigenous inhabitants play a significant role in their protection by granting them spiritual ownership of the resources of the SFS and making them active and responsible participants.

Based on these findings, we propose the following actionable framework

- ✓ **Establish community monitoring teams in each municipality using standardized assessment forms**
- ✓ **Create an immediate protection zone around 28 SFS containing rare tree species**
- ✓ **Develop illustrated species guides to improve community management**
- ✓ **Integrate SFS into provincial development plans as a "biocultural heritage site"**
- ✓ **Conduct biennial surveys to measure changes in conservation attitudes**
- ✓ **Create a digital register of SFS with conservation status updates**

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